connected. The specific potential in the example here indicates either certain standard potential, specific DC potential, ground potential or a floating status, whichever suitable is selected according to a style of an embodiment. Also, a resistance as a second impedance element connected between the AC voltage generator and the inverting input terminal of the operational amplifier may further be added.

[0011] According to the above structure, a certain voltage is applied to the capacitor to be detected, most of electric current that flows through the capacitor to be detected is further sent to the capacitor (the first impedance element), and then a signal corresponding to the electrostatic capacitance of the capacitor to be detected is output from a signal output terminal.

[0012] Here, the capacitor to be detected and the electrostatic capacitance detection circuit are located as adjacently as possible to reduce noise mixed in the signal line, which connects the electrostatic capacitance detection circuit with the capacitor to be detected, and also reduce the stray capacitance generated at the signal line. Or, the capacitor to be detected, the first impedance element and the impedance converter are located as closely as possible.

[0013] In this patent document, "closely" means that the stray capacitance of the signal line is in a situation where the capacitance does not exceed ten times as much as a bigger value of either the capacitance value of the capacitor to be detected or the capacitance value of the first capacitive impedance element. It was found through experiences that the electrostatic capacitance detection circuit of the present invention can prevent its detection sensitivity from being highly deteriorated when the stray capacitance of the signal line is set to have a capacitance value that does not exceed ten times as much as the capacitance value of the element connected. This stray capacitance of the signal line is measurable if it is measured under a situation where the capacitor to be detected, the first impedance element and the impedance converter are not connected to the signal line. In this patent document, a status where an object is in contact with other object side by side under the above condition for being closely is called as "adjacently".

[0014] Also, in addition to the said electrostatic capacitance detection circuit, it is possible to add an inverting amplify circuit that inverts the signal at the signal output terminal and an adding circuit that adds up an output signal of the impedance converter and an output signal of the inverting amplify circuit. Also, resistance may be connected in parallel with the capacitor (the first impedance element).

[0015] As a practical application of the present invention, it is preferable that the capacitor to be detected is a capacitance type of sensor that detects a physical quantity according to a fluctuation in the capacitance, that the electrostatic capacitance detection circuit is formed on a printed circuit board or a silicon substrate, and that the capacitance type of sensor and the board are fixed or composed as one. As a further specific example, it is more preferable that a capacitor microphone is adopted as the capacitor to be detected, that the electrostatic capacitance detection circuit is embodied by an IC, that the capacitor microphone and the IC are integrated into one and put in a shield box as a microphone used for a mobile phone or the like. In this case, the capacitor microphone and the IC are fixed adjacently and connected with a conductive board, a wiring pattern, a wire bonding or the like.

BRIEF DESCRIPTION OF DRAWINGS

[0016] **FIG. 1** is a circuit diagram showing a conventional electrostatic capacitance detection circuit.

[0017] **FIG. 2** is a circuit diagram of an electrostatic capacitance detection circuit according to a first embodiment of the present invention.

[0018] **FIG. 3 A** through E are diagrams showing examples of an impedance converter usable in the present invention.

[0019] **FIG. 4** is a circuit diagram of an electrostatic capacitance detection circuit according to a second embodiment of the present invention.

[0020] **FIG. 5** is a diagram showing a practical example of the electrostatic capacitance detection circuit of the present invention used for electric devices (a cross section diagram of a microphone).

[0021] **FIG. 6 A** is a plain diagram showing an external outline of the microphone shown in **FIG. 4**.

[0022] **FIG. 6 B** is a front view diagram showing the external outline of the microphone shown in **FIG. 4**.

[0023] **FIG. 6 C** is a bottom view diagram showing the external outline of the microphone shown in **FIG. 4**.

[0024] **FIG. 7** is a cross section diagram of other example of the microphone.

[0025] **FIG. 8 A** is a plain diagram showing an external outline of the microphone shown in **FIG. 6**.

[0026] **FIG. 8 B** is a front view showing the external outline of the microphone shown in **FIG. 6**.

[0027] **FIG. 9** is a circuit diagram of the electrostatic capacitance detection circuit according to other embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0028] The following provides a detailed explanation of embodiments of the present invention with reference to diagrams.

[0029] (First Embodiment)

[0030] **FIG. 2** is a circuit diagram of an electrostatic capacitance detection circuit **10** according to a first embodiment of the present invention. In this diagram, this electrostatic capacitance detection circuit **10** is connected to a capacitor to be detected **17** that is a subject for detection (i.e. a capacitance type sensor that detects various types of physical quantities using a fluctuation in the electrostatic capacitance Cs such as a capacitor microphone in this example.)

[0031] This electrostatic capacitance detection circuit **10** comprises an AC voltage generator **11** that generates AC voltage, a resistance (R1) **12**, a resistance (R2) **13**, an operational amplifier **14**, an impedance element **15** (a capacitor with capacitance Cf in this example) and an impedance converter **16**, and outputs a detection signal (voltage V out) corresponding to electrostatic capacitance of the capacitor **17** from a signal output terminal **20**.